

The Jurassic irregular echinoid *Nucleolites clunicularis* (Smith)

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Synopsis

The often-cited echinoid species *Nucleolites clunicularis*, from the Middle Jurassic of western Europe, has been interpreted in a broad sense in the literature, and in consequence its systematic position has become obscured. It is shown here that the species should be ascribed to William Smith. His holotype exists and is redescribed. Its age is Oxfordian (Corallian).

Introduction

Much of the curator's work consists in the painstaking accumulation of information about specimens, their cataloguing and their preservation and retrieval from storage when required. This work is largely a matter of careful routine, but occasionally a detective story emerges, such as the one recorded here, which is of additional importance to the systematist. *Nucleolites clunicularis* of authors is a common fossil at certain horizons in England, in sediments ranging from Bajocian to Oxfordian age, and appears frequently in faunal lists particularly those of the Cornbrash. It is sometimes ascribed to authors such as Lhwyd, Fleming or Conybeare and includes diverse forms which can be referred to several distinct species. However, which of these diverse forms is in fact the true *N. clunicularis*?

The taxonomic position of *Nucleolites clunicularis*

Edward Lhwyd (1699 : 48) described an echinoid figured by Lister (1678 : tab. 7, fig. 26), giving it the name *Echinites clunicularis*. This species does not appear to have been described or mentioned again by a pre-Linnaean author, except in the later illustrated edition of Lhwyd's book published in 1760. The first post-Linnaean use of the name was in William Smith's *Stratigraphical System of Organized Fossils* (1817a) and in the third part of his *Strata identified by Organized Fossils* (1817b). As an appendix to the first of these (1817a : un-numbered pages at end) Smith wrote some 'Observations on Echini', on the second page of which appears the following:

The Stratigraphical Table exhibits many instances of repetition of the same species in more than one stratum, and a little attention evinces the accuracy of an observation previously made, that "*similar strata contain similar fossils*;" Clypeus, No. 2 (*clunicularis* Lhwyd), is a common instance. This species is repeated in five different strata, all of them calcareous, for the fossils in the Clay over the upper Oolite lie within a small depth of the rock, and are generally filled with stony matter.

Yet although the same species is repeated in these different strata, a considerable difference in appearance may be traced between specimens from the Pisolite and others from the Cornbrash and Oolites. These last are thinner at the edge, with a more undulated base and flatter sides, particularly that side containing the groove.

It is evident from the above quotation that Smith considered the specimens from above the Cornbrash to be more typical of the species. In the 'Stratigraphical Table of Echini'

(1817*a* : second col. plate) he described *Clypeus* No. 2 as follows:

Oblong, subquadrangular; base concave in the middle; mouth small, five-angled; upper side convex, with a large deep furrow on one side from the apex to the margin; rays ten biporous lines in five pairs, depressed on the base: apertures opposite, excentric from the broad or furrowed end. Shell unequally covered with small granula, most numerous on the base.

He records it from the 'Under Oolite, Upper Oolite, Clay over the Upper Oolite, Cornbrash, and Coral Rag and Pisolite'. The only mention of *Clypeus* species 2 in the general text of this work is on page 110 on which is recorded

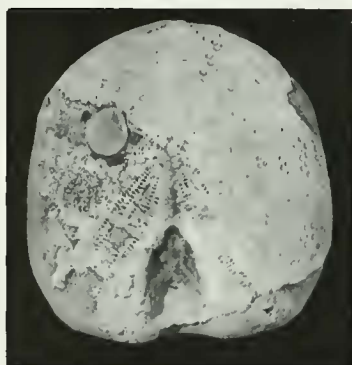
Clypeus. Coral Rag and Pisolite
Churchill

but this section of his work is concerned with the 'Under Oolite'.

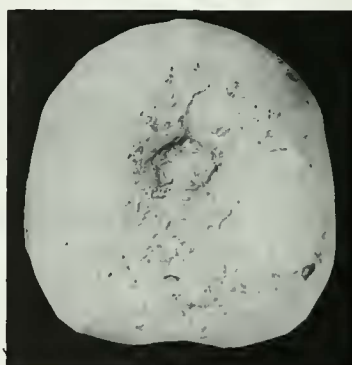
In the second work (1817*b*), Smith figured on the plate illustrating 'Coral Rag and Pisolite' fossils a *Clypeus* to which no specific name was given (pl. facing p. 20, fig. 6). This is the only example of *Nucleolites* which Smith illustrated and, furthermore, it is evidently the form that he considered to be '*Clypeus*' *clunicularis*, for he stated (1817*b* : 20):

This latter specimen, as shown in my "Stratigraphical Table of Echini" is one of the characteristic distinctions of the Pisolite part of the rock.

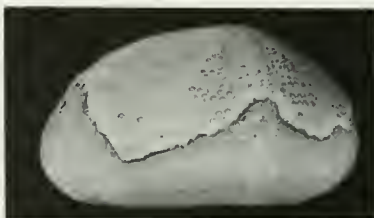
He records the species from Meggot's Mill, Coleshill, Longleat Park and Hinton Waldrish. The figured specimen is in the British Museum (Natural History), reg. no. E495; it is the only



1



2



3

Figs 1-3 *Nucleolites clunicularis* (Smith). E495, lectotype herein selected, $\times 2$. The specimen was coated with ammonium chloride to enhance the detail. 1, apical surface. 2, oral surface. 3, lateral view.

surviving specimen of this species in William Smith's collection and is labelled as being from Meggot's Mill.

Although we have followed a rather tortuous route, we now have a valid species described and figured by Smith to which he gave the name *Clypeus clunicularis*. Although he refers to Lhwyd's description, the specimens referred to by Smith from the Coral Rag and Pisolite form the syntype series of which the figured specimen survives and is here formally selected as the **lectotype**.

Subsequently, Conybeare (1822 : 188), when describing the Coral Rag, referred to *Clypeus clunicularis*, citing fig. 6 of Smith's plate. Fleming (1828 : 479) also cited Smith's fig. 6 and Conybeare's citation in his listing of *Clypeus clunicularis*. Fleming gave the name *Clypeus lobatus* to the specimen figured by Lister (1678 : tab. 7, fig. 26), to which Lhwyd had given the name *Echinites clunicularis*. Unfortunately, Thomas Wright (1859 : 334) revised the description of '*Echinobrissus clunicularis*' at a time when some workers adopted names published before Linnaeus' *Systema Naturae* and others did not. Wright attributed the species to Lhwyd, but correctly pointed out that it is impossible to decide from the illustrations cited by Lhwyd whether the Inferior Oolite or the Coral Rag form is represented by the drawings. Wright then restricted his '*Echinobrissus clunicularis* Lhwyd' to the forms found in the sediments ranging from the Inferior Oolite to the Cornbrash, excluding the typical Coral Rag form altogether. He relegated into synonymy valid specific names already given by French authors to the Bajocian and Bathonian forms which are available for use and are used by continental authors. In the preparation of faunal lists, most English authors have followed Wright's interpretation of *Nucleolites clunicularis*. In this instance, however, common usage cannot be invoked as an excuse for setting aside all designations of *Nucleolites clunicularis* previous to that of Wright (1859 : 332-337). Moreover, Wright's figured specimens (1859 : pl. XXIV, figs 1a-k) have not been located in any collection. It would greatly facilitate future revision of the Jurassic species of *Nucleolites* to return to the correct definition of *N. clunicularis* given by Smith (1817).

Systematic Description

Superorder ATELOSTOMATA Zittel, 1879

Order CASSIDULOIDA Claus, 1880

Family NUCLEOLITIDAE Agassiz & Desor, 1847

Genus *NUCLEOLITES* Lamarck, 1801

Nucleolites clunicularis (Smith, 1817)

MATERIAL. E495, the lectotype (herein selected), in the William Smith collection of the Department of Palaeontology, British Museum (Natural History). Figs 1-4.

PRESERVATION. The specimen is very worn, and has lost slightly more than half of the original test. The remaining test is present above the ambitus and has the apical system preserved, together with petaloid ambulacra I, II, and III, the adoral ends of which are missing. A small portion of the adapical end of the ambulacral petal IV is present, and about half of ambulacral petal V, with portions missing from the middle of its length and at the adoral end. The periproct is mostly covered by matrix. The remainder of the specimen is an internal cast.

DIAGNOSIS. Test almost as broad as long. The outline is rounded anteriorly, the lateral margins almost straight, and marked with a shallow sulcus at the posterior end. An elongated V-shaped deep groove leads from the periproct to the sulcus. Apical system tetrabasal, anterior of centre, with test preserved between it and the periproct rim. Test moderately inflated above the ambitus, with the highest point towards the anterior end. Petaloid ambulacra about equal, narrow and open. Ornament on the test consists of closely packed,

asymmetrically developed primary tubercles surrounded by small milliary tubercles. Oral surface gently rounded. Mouth pentagonal and situated vertically below the apical system.

DIMENSIONS. Length of test 24.4 mm, width 23.1 mm, maximum height 13.5 mm. The approximate lengths of the ambulacral petals are: I > 13.3 mm, II > 11.7 mm, III > 11.7 mm, IV > 11.7 mm, V > 12.5 mm.

APICAL SYSTEM. This is small, worn and incomplete. Fig. 4.

(a) *Ocular plates.* Remains of the ocular plates IV and V show the ocular pore in a roughly triangular plate. Depressions marking the positions of the ocular pores are also present in plates I, II, and III.

(b) *Genital plates.* Genital plates 1, 3, and 4 are present with elongate genital pores. Each pore is about 0.8 mm long. The precise shape of each plate is obscured by erosion of the test. There are the remains of a dividing bar across the short width of each of pores 1 and 3 but no such bar is present in pore 4. Genital plate 2, the madreporite, is large, extends to the centre of the apical system, and is more or less circular in outline. It has many pores opening onto its surface. Genital plate 5 is missing, and in its place, extending posteriorly to meet the interambulacrum 5, are four small plates. One of these is five-sided, ornamented by one larger tubercle surrounded by several smaller tubercles, and is situated adjacent to the madreporite. The second is posterior to the first and is an irregularly-shaped plate bearing several small tubercles. Laterally adjacent to both is a third plate with an irregular outline and bearing several small tubercles. The fourth plate is small and is situated anterior and adjacent to the third, but is too worn to describe accurately.

PERISTOME. None of the original test is present on the oral surface, only the internal cast. The peristome is pentagonal, 4.6 mm across the widest part, and 3.6 mm from the anteriormost point to the base of the pentagon. The peristome is in a shallow depression in the test and is eccentric anteriorly. It is 11.6 mm from the posterior ambitus to the pentagon base, and 8.8 mm from the anterior part of the ambitus to the pentagon apex.

PERIPROCT. This is present at the bottom of a deep furrow which broadens posteriorly into interambulacrum 5. The furrow is 5 mm wide at the mid-point of the test where some original test remains. The furrow is a long V-shape, extending from the ambitus to just posterior of the apical system. The walls are steep, and are about 2.75 mm high at the deepest part. In cross-section the furrow is U-shaped. Traces of the periproct can be seen at the adoral end and at the adapical end. At the adoral end the margin of the periproct is a broad V-shape. The central portion is buried beneath matrix. At the adapical end the peristome closes in a shallow V.

APICAL SURFACE. (a) *Ambulacra.* None of the ambulacra are complete. Paired ambulacral petals I and V, seen as internal casts and with some original test, are slightly longer than paired ambulacral petals II and IV and unpaired ambulacral petal III. They are all flush with the surface of the test; all are long and thin, and all have a maximum width of 3 mm. The paired ambulacral petals have their anterior pore rows in an almost straight line from the gentle curve near the apical system. The posterior pore rows are gently curved posteriorly. Ambulacral petal III has pore rows which are more or less straight to the anterior margin.

All the petals have similar types of pore-pairs and ornament. The pores of each pore-pair are not equal. The adradial pores are elongate and almost tear-drop shaped, surrounded by a smooth, shallow, raised rim. The perradial pores are circular and also have a smooth raised rim; they are slightly adoral to the adradial pores, so that the pore-pairs are oblique. Between the adradial and perradial pores is a small swelling, but because of wear of the test its exact nature cannot be determined. Between each pore-pair is a low ridge bearing three or four small tubercles. The interpore zone has ornament which consists of large tubercles surrounded by smaller tubercles. The large tubercles alternate in position so that each one is adjacent to one which is either perradial or adradial in position to itself, both along the

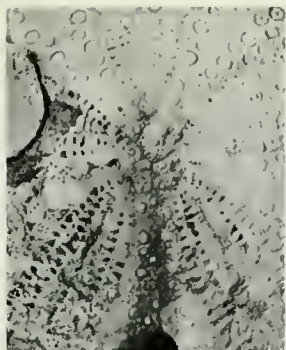


Fig. 4 *Nucleolites clunicularis* (Smith). E495, lectotype, detail of part of the apical surface to show the apical system, $\times 5$. The specimen was coated with ammonium chloride.

length and across the width of the petal. Where a large tubercle is adjacent to an interpore ridge, the ridge bears only three small tubercles. Other ridges have four small tubercles. The large tubercles have broad, low, crenulated bosses, but no mamelons are preserved intact; the weathered remnants show them to have been relatively large. Each boss has a fairly deeply indented scrobicule which is more or less circular in outline. The bosses are centrally placed on the scrobicules near the apical end of ambulacral petals II, III and IV but towards the ambitus they are placed adorally eccentric on the scrobicule. Each tubercle is surrounded by a ring of smaller tubercles. The bosses of the large tubercles retain their central position throughout the length of ambulacral petals I and V.

(b) *Interambulacra*. The ornament of the interambulacra consists of tubercles similar to those of the ambulacra. Near the apical region the bosses on interambulacra 1–4 are placed centrally on the scrobicules, but they become increasingly eccentric towards the ambitus, anteriorly on interambulacra 2 and 3, and anterolaterally on interambulacra 1 and 4. The ornament of interambulacrum 5 is similar to that of the other interambulacra, but the tubercle bosses are centrally placed within the scrobicules over the whole of the surface. Tubercles within the furrow and on the furrow walls have been almost completely weathered away. Only faint remains can be seen. Those on the 'shoulders' of the furrow have similar preservation to the tubercles on the rest of the test. At the adapical end of the furrow the test is rather deeply undercut. Above the undercutting, interambulacrum 5 continues towards the apical system in a narrow, slightly depressed, almost parallel-sided strip of test. The ornament is similar to that of the rest of the test.

NOTE ON THE ORNAMENT. The tubercles of the interambulacra are remarkably uniform in size over the test, except near to the apical system where they are slightly smaller. Those further from the apical system measure 0.5 mm–0.75 mm in diameter, and those near the apical system about 0.3 mm. The ambulacral tubercles show similar uniformity of size, and are slightly smaller than those of the interambulacra. They are 0.5 mm in diameter further from the apical system, and about 0.25 mm nearer to it. The tubercles are quite closely packed and have a regular order, alternating along the length of the ambulacra, whilst those of the interambulacra alternate both in horizontal rows and in a dorso-ventral direction at the interradiial position.

ORAL SURFACE. None of the test remains on the oral surface nor on the lateral parts of the specimen. The lower part of the specimen is represented by a badly worn internal cast. The ambulacra are present as raised portions of the cast, with the pore pairs seen as closely packed horizontal bars, or holes, arranged in two rows for each ambulacrum. The bars join a naked area along the middle of the ambulacrum.

Stratigraphy and locality of the lectotype

Smith recorded the geological horizon and geographical locality of the lectotype as the Coral

Rag of Meggot's Mill, Coleshill. The specimen itself has the remains of writing on it which reads 'Rag. Hill'. This indicates that it comes from the Coral Rag of Coleshill.

Coleshill is about 4.5 km north of Shrivenham, Berkshire, and about 3.5 km west of Great Coxwell. Just to the south-west of the village, at National Grid reference SU 235934, is a disused mill, marked on the 1 : 10 560 (6 inches : 1 mile) Ordnance Survey map as 'Coleshill Mill'. It is quite likely that this is the original locality. The mill is situated on the upper Oxfordian ('Corallian').

Smith (1817*b* : 19) writes 'The Coral Rag consists chiefly of lumps of coralline Limestone, which in the quarry are very rough, irregular, and dirty; . . . The Pisolite Freestone beneath is softer.' He clearly states (1817*b* : 20) that *Clypeus* 'is one of the characteristic distinctions of the Pisolite part of the rock.' His stratigraphic terms may be compared with modern terms in the following table:

| Chronostratigraphy | | Lithostratigraphy | |
|-----------------------|------------------------------------|--------------------|------------------------|
| | Stage | Modern terminology | Smith's terminology |
| Upper Jurassic (part) | { Oxfordian, including 'Corallian' | Coral Rag | Coral Rag and Pisolite |
| | | Upper Cornbrash | Cornbrash |
| | | Lower Cornbrash | |
| | | Bradford Clay | Clay over Upper Oolite |
| Middle Jurassic | { Bathonian | Great Oolite | Upper Oolite |
| | | Inferior Oolite | Under Oolite |
| | { Bajocian | | |

Acknowledgement

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